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SCIENCE AND TECHNOLOGY

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27 June 1984

CHINA REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

Huan Xiang on Catching Up in New Technology (ZHONGGUO XINWEN SHE, 17 May 84)	1
Qian Xuesen on Understanding the 'New Technological Revolution' (Qian Xuesen; SHIJIE JINGJI DAOBAO, 2, 9 Apr 84)	3
Implement Reform in Scientific Research Units (GUANGMING RIBAO, 24 May 84)	15
Nei Bongzhen Hails Scientific Equipment Forum (RENMIN RIBAO, 28 May 84)	17
Hefei Technological Revolution Symposium Ends (Hu Yang, et al.; GUANGMING RIBAO, 10 May 84)	18
Commentator's Article on Hefei Symposium (GUANGMING RIBAO, 10 May 84)	20
Make Science Serve Economic Construction (XINHUA Domestic Service, 22 Dec 83)	22

APPLIED SCIENCES

Journal Encourages Geological Work in Xinjiang (Chen Zhefu; ZHONGGUO DIZHI, No 2, 1984)	25
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NATIONAL DEVELOPMENTS

HUAN XIANG ON CATCHING UP IN NEW TECHNOLOGY

HK180405 Beijing ZHONGGUO XINWEN SHE in Chinese 0713 GMT 17 May 84

[ZHONGGUO XINWEN SHE headline: "Huan Xiang Says: Meet the Challenge of the New Technological Revolution With the Spirit of 'Trying Hard to Catch Up'"]

[Text] Beijing, 17 May (ZHONGGUO XINWEN SHE)--Huan Xiang, China's famous specialist in international affairs, says: Confronting the current international economic situation and the merging new technological revolution, we must seize the opportunity and try hard to catch up. If we fail to do our utmost to catch up, China will lag behind in this field in the Asia-Pacific region.

This article entitled "Have a Clear Understanding of the International Economic Situation, Usher in the New Technological Revolution" was published yesterday in the 10th issue of HONGQI.

The article revealed that the top leaders of the CPC call for reaching or approaching the standards of the developed countries within 30 to 50 years.

Huan Xiang put forward seven proposals to "try hard to catch up":

1. Formulate policies for priorities and lay stress on vigorously developing the most promising sophisticated industries. We must first develop micro-electronic technology, bioengineering, light transmission communications, and so on. Meanwhile, we must also develop basic industry and the communications industry, particularly the energy industry and labor intensive industry;
2. The development of new technologies should be integrated with the technical transformation and innovation we are facing at present;
3. The computer industry should meet the needs of the communications industry and other "vanguards";
4. It is necessary to carry out all-round reform in the management system;
5. It is necessary to first select some regions which are economically, scientifically, and technologically developed and which have modern basic facilities, and then gradually establish one or two technological centers which can combine education, research, development, design, production, and domestic and international marketing;

6. Import foreign technologies and investment;

7. Pay close attention to solving the problems of science and technology ranks within the country and invite talented people from other countries to work in China.

In his article, Huan Xiang warned that in catching up with the advanced, we must not follow the pattern of the "Great Leap Forward," run things counter to scientific knowledge, and blindly try to "catch up" without careful consideration; but must make efforts in a planned, organized, and step-by-step manner, under proper leadership and with a scientific basis.

CSO: 4008/336

NATIONAL DEVELOPMENTS

QIAN XUESEN ON UNDERSTANDING THE 'NEW TECHNOLOGICAL REVOLUTION'

HK230700 Shanghai SHIJIE JINGJI DAobao in Chinese 2, 9 Apr 84

[Article by Qian Xuesen [6929 1331 2772]: "Certain Basic Problems Concerning Understanding the New Technological Revolution"]

[2 Apr 84 p 3]

[Text] Editor's note: We must study and create the science of socialist modernization, which is actually the theory of the management of the entire country as well as the theoretical basis of social systems engineering or social engineering. This subject also concerns the application of systems science and systems engineering to the work of overall organization and management of the country.

I. Scientific Revolutions, Technological Revolutions, and Social Revolutions

The question we are going to discuss actually concerns the laws of development of man's social activities. Nothing in the world ever develops smoothly and steadily, but invariably follows a tortuous path. At various times, there may be advances, stagnation, or leaps. A leap is a revolution.

I wish to expound on this question from four aspects. I will first discuss three of them.

The first aspect concerns leaps in man's understanding of the objective world. These can be called scientific revolutions. "Scientific revolution" is a term used by an American philosopher of science, Thomas Kuhn. He wrote the book "The Structure of Scientific Revolutions." His book contains some idealist viewpoints which we cannot accept. However, he holds that man's understanding of the objective world does not develop smoothly and steadily, and sometimes revolutions may occur. The concept of scientific revolution is compatible with Marxist philosophy.

In this connection, what scientific revolutions have occurred in the history of science? What developments were leaps in man's understanding of the objective world? For example, during the 16th century, the heliocentric theory, which states that the earth revolves round the sun, appeared in Western countries. At that, this was a leap in man's understanding of the objective world.

The appearance of Newtonian mechanics in the 17th century was another scientific revolution in man's understanding of the objective world. The discovery of oxygen in the latter half of the 18th century was another leap in man's understanding of the objective world. In the 19th century, there were three epoch-making scientific discoveries, namely, discoveries of the cell, the transformation of energy, and the evolution of living organisms. Engels considered them epoch-making scientific discoveries. Scientific revolutions also took place in the realm of social sciences, and there were two revolutions of this kind in the mid-19th century, both of which were initiated and caused to develop by Marx. The first one was the putting forth and founding of historical materialism by Marx. This was a scientific revolution. Soon afterward, Marx put forth the surplus value theory. This was also a scientific revolution. Both of these revolutions were leaps in man's understanding of his own society. Later, the electromagnetic field theory appeared, which integrated electricity with magnetism. In the early 20th century, there was an even larger number of discoveries, for example, Pavlov's discoveries in psychology, the relativity theory, quantum mechanics, and so on. At present, a scientific revolution in quantum field theory is probably brewing. This theory attempts to unify the roles of four categories of forces in physics; these are the gravitational force, which is weakest, as well as weak interaction, electromagnetic interaction, and strong interaction. These four kinds of interactions must be unified and a general and unified field theory must be established. At present, this task has not been accomplished. Its accomplishment will certainly be a scientific revolution. I wish to demonstrate through these examples that scientific revolutions are leaps in man's understanding of the objective world.

The second aspect concerns the question of man acquiring an understanding of the objective world in order to transform the objective world. Do leaps occur in man's transformation of the technology existing in the objective world? The answer is of course in the affirmative. This kind of leap is a technological revolution. The term technological revolution was used at a very early time by Comrade Mao Zedong. In his comments and instructions, written in a document in 1969, he very clearly stated that ordinary and minor technological improvements can be called technological innovations, while major and basic technological changes which have extensive effects are called technological revolutions. Comrade Mao Zedong not only put forth this term, but also gave three examples of technological revolutions, namely, the appearance of the steam engine, the appearance of electric power, and the appearance of atomic energy (which we now call nuclear energy) in today's world. Thus, the meaning of technological revolution has been very precisely set forth.

In light of this meaning, we can also trace back to other technological revolutions in history. In ancient times, man began to learn how to use stone tools. At that time, the making of stone tools was an extraordinary major achievement to man's transformation of the objective world. It was a technological revolution in history. The use of fire can also be said to be a technological revolution. In modern times, leaps in man's transformation of science and technology in the objective world include the appearance of the steam engine, the diesel engine, chemical engineering technology, electric power, radio technology, and aeronautics technology. At present, there are new technological

revolutions which we frequently talk about, for example, those involving computers, genetic engineering, laser technology, nuclear energy, nuclear technology, space technology, marine engineering, and so on. Therefore, there are a number of, or a group of, new technological revolutions, instead of a single one. I think that the group of new technological revolutions probably should not only include the abovementioned items, but should also include systems engineering. This is because nowadays the organization and management of a complicated natural or artificial system, such as a factory, a project, or even something as large as a country, do not merely depend on thinking, envisioning, and conjecture, but must depend on quantitative scientific analysis. This represents an extraordinary change, which is the introduction of systems engineering. Therefore, the introduction of systems engineering should be regarded as a leap in man's transformation of the objective world, that is, a technological revolution.

A third kind of revolution is the leap in the realm of social systems, which we call social revolutions, or simply revolutions. For example, the collapse of the primitive communes and the birth of the slave system constituted a leap in the realm of social systems, or constituted a social revolution. Subsequent social revolutions or leaps in the realm of social systems included the transformation of the slave society into a feudal society and the transformation of the feudal social system into a capitalist social system. The establishment of the socialist and communist social system is of course, a leap in the realm of social systems, or a social revolution.

II. Revolutions in Production

The term revolution in production [Chanye Geming (3934 2814 7245 0730)] was used by Engels as early as in the book "The Condition of the Working Class in England" published in 1845. However, there is great confusion in the capitalist countries' use of the terms: Revolution in production, industrial revolution, and scientific and technological revolution. Under this condition, it would be fine if we were not to talk about revolution in production for the time being. However, we cannot evade this question because this term appears in the works of Engels and Marx. We should according to the concepts of dialectical materialism and historical materialism, study what revolution in production is. Moreover, what the capitalist countries call revolution in production, "the fourth global revolution in production," "the third tide," and so on, also contain a hidden idea which we cannot agree to, that is: Marxist theory, or Marxism, was derived through analysis based on the results of the first revolution in production, and this is the basis of your scientific socialism; but now because a new revolution in production has appeared and because Marx, Engels, and Lenin naturally could not have seen this new revolution, their theories no longer hold. The criticism against us is that our set of things--our communism and our scientific socialism--have become something questionable. In his book, Toffler vigorously preaches that now that a new revolution in production, or "the third tide," has appeared, capitalism can be saved and the contradictions of capitalism can now be resolved. This kind of argument naturally aims to generate confusion, just as one tries to make water turbid by stirring up mud at the bottom of water. It is naturally groundless. We must solemnly analyze and refute it. I think we should aim to acquire a new understanding of the meaning of revolution in production.

To achieve this aim, we must go back to Engels' book "The Condition of the Working Class in England." Engels wrote a great deal about the changes in industry, communications, transportation, and agriculture, which occurred in England over a period of nearly 60 years from the end of the 18th century to the 19th century. He called these drastic changes a revolution in production. Engels' book enables us to understand that a revolution in production definitely does not mean a partial change and does not mean a leap arising from the application of production technology to a specific realm, but means some overall leaps and changes affecting the entire system of production. Changes occur not only in industry, agriculture, and communications and transportation, but also in economic relations. Therefore, expressed in the form of a definition, a revolution in production consists of leaps and changes in the organizational structure of the production system and in economic structure. It consists of leaps which are caused by a development of the productive forces, which is in turn promoted by advances in production technology.

Is this definition applicable to the history of man's development? Are there other examples in human history? I think revolution in production did occur in ancient history. A revolution in production happened in the primitive commune period. The appearance of crop growing and animal husbandry greatly changed the production system whereby man made a living by relying solely on collecting or hunting for plant products or animal products in nature. Thus, man himself could control production, at least partially, resulting in a leap in the realm of the production system. Therefore, the appearance of agriculture was a revolution in production, probably the first of its kind in human history. The second revolution in production possibly happened in the slave society; for the first time, the production of commodities appeared, that is, production was carried out for the sake of exchange. This was also a leap in the realm of economic structure and in the organizational structure of the production system, and was consequently also a revolution in production. Therefore, the revolution in production which occurred between the end of the 18th century and the beginning of the 19th century was the third revolution in production in human society.

Can revolutions in production be distinguished from social revolutions? Are they different things? I think they can be distinguished from each other and they are different things. In the first place, past examples can enable us to understand this point. For example, Marx said that though the appearance of limited joint-stock companies under the capitalist system was a change in the form of production, this change was an instance of sublation within the scope of the capitalist mode of production itself and did not cause the capitalist system to change. Today, in capitalist countries, some workers hold one or more shares in some companies. However, the number of shares owned by workers is negligible, so that instead of exercising great control over the companies, the workers must obey the capitalists and must be exploited by them. Therefore, great changes or even leaps may occur in economic structure and in the organizational structure of the production system, leading to a revolution in production without any change in the social system.

On this question, things can be seen more clearly in our country. Considering our social system or our state system, after the transition period, and since the adoption of the first constitution of the PRC at the first session of the

First NPC convened in September 1954, our system has remained unchanged and we have always had a socialist system and a socialist state. However, there have been many changes in the production relations and in the superstructure. First, the state system as one aspect of the superstructure has changed many times. Changes have accompanied each revision of the constitution. Our existing new constitution, drawn up in April 1982, represents a great advance compared with the old constitutions. Second, considering those reforms of the system of leading cadres of our party and our state which Comrade Deng Xiaoping put forth, are they not some major changes to come in the realms of production relations and superstructure? Third, do not both Comrade Hu Yaobang's report at the 12th CPC Congress and Comrade Zhao Ziyang's reports at the 4th session of the 5th NPC and the 1st session of the 6th NPC clearly set forth the guiding principles and tasks of reform as well as point out those aspects of the production relations and the superstructure which urgently need to be changed? Fourth, there have been heartening changes in our countryside over the past several years, which have been brought about by reforms in the production relations and the production system. Fifth, at present, in our country, there are national corporations such as the National Shipping Corporation, the National Petrochemical Corporation, the National Nonferrous Metals Corporation, and so on. Are these not economic entities which organize production on the basis of entire industries and which are similar in form to monopolist companies abroad? We can give many other examples of changes in production relations and in the superstructure of the production system. Because changes and development will lead to leaps, revolutions in production will happen under the precondition that the social system remains unchanged.

Comrade Mao Zedong said at an early time that in socialist society, the contradiction between the production relations and the productive forces and that between the superstructure and the economic base continue to be the basic contradictions. Our productive forces must invariably continue to develop, and therefore the economic structure and the organizational structure of the production system must inevitably continue to develop, so that leaps or revolutions in production will occur.

We have described revolutions in production as leaps in the realm of economic structure and in the organizational structure of the production system, and we have distinguished them from social revolutions. Is this compatible with historical materialism? I think so, in light of the arguments given above. Moreover, the arguments above have also demonstrated that the two formulations used abroad--the so-called "industrial revolution" and the so-called "scientific and technological revolution"--are not precise. The first formulation, being limited to a narrow scope, is not comprehensive enough, while the second formulation, whose connotations are not clear, cannot be distinguished from the scientific and technological revolutions that we talk about. Our view is more profound and can more clearly explain the essence of the issues under consideration compared with some Western economists' "long cycle theory" which is based on statistical data. However, we should continue to study hard, and we should particularly study the question of the interactions between scientific and technological revolutions, revolutions in production, and social revolutions.

[9 Apr 84 pp 3, 8]

[Text] III. The Questions We Should Study in Working Out Measures to Be Taken

Now, in studying what measures are to be taken, everyone pays relatively greater attention to discussing technological revolutions. However, we should also consider any scientific revolutions or revolutions in production [Chanye Geming 3934 2814 7245 0730] that may possibly occur, because all three categories of revolution are directly related to our country's economic construction, national defense building, and social development.

New scientific revolutions will greatly widen our horizons and give us new strength. As to the question of revolutions in production, I think our country must "make up a missed lesson," that is, we must make up what we did not gain from the revolution in production which occurred at the turn of this century. I think that in the past, when we studied Lenin's "Imperialism, the Highest Stage of Capitalism," we paid attention to criticizing the reactionary nature of imperialism alone, at the expense of studying the laws of modern large-scale production as embodied in the production system under imperialism. Whenever we talked about imperialism, we thought everything associated with imperialism was decadent and nothing could be learned from it. We must learn from the developed countries the methods of organizing and managing modern large-scale production, and we must build an organizational structure, and an economic structure, of modern large-scale production. These structures do not just mean a number of individual factories, but constitute a national production system which, moreover, is an open system catering to the whole world. However, what we have at present are "individual isolated enterprises," "a system of ownership by individual departments," "small communities each consisting of a single enterprise," and "eating out of the same big pot." Our circulation system and financial business are backward. Under capitalism, while free capitalism was developing into monopoly capitalism, the organizational structure and the economic structure of the production system experienced a leap. We must make up what we did not gain from this leap. We have not yet understood the fourth revolution in production in human history.

Naturally, in working out what measures we should adopt, we must study what changes in the organizational and economic structures of the production system may be caused by the series of technological revolutions that are now appearing, and we must study whether another revolution in production may occur. People abroad like to talk about the so-called "information society," (xinxi shehui 0207 1873 4357 2585] and monopolist financial groups in Japan are studying the conversion of financial monopoly into so-called "information monopoly." [Xinxi longduan 0207 1873 1096 2451] in foreign languages, xinxi [0]08 1873] and "qingbao" [1906 1032] are the same word, and the two terms can be used interchangeably. However, I feel that either "xinxi" and "qingbao" actually represents a full utilization of the entire spiritual wealth, or knowledge, created by man. In the past, we said that science and technology were productive forces. Now, we must extend our view and say that the entire spiritual wealth created by man belongs to the category of productive forces. Therefore,

knowledge and the development of intellectual resources are matters of prime importance. However, whether you know how to use knowledge and whether you can use it opportunely are important questions. The crucial question is whether we can opportunely master the entire domain of technology and the entire spiritual wealth created by man, and whether we can immediately acquire them whenever we need them, rather than whether today we can catch up with the rest of the world in some specific technological items or knacks. This is a crucial question concerning our greeting of the new technological revolution, or our greeting of the new revolution in production which will soon appear. Therefore, knowledge and the development of intellectual resources are matters of prime importance.

Earthshaking changes are now occurring in China's countryside. Are these changes brewing a revolution in production in the 21st century? Such a revolution means that rural production will become a highly knowledge-intensive, highly technology-intensive, and highly efficient large-scale agricultural system, that is, a comprehensive agricultural system. This change will in time cause the organization of rural areas into small market towns. We must consider this project. At present, instances of these changes are actually occurring over the vast territory of our motherland. Judging from the condition of our entire country, this prospect will probably be realized on a nationwide scale by the centenary of the founding of the PRC.

Is this prediction well-grounded? Yes, it is. Let us first study the question of energy resources. Solar energy is the largest source of energy. Let us suppose that only half of our 9.6 million square km of land can be used for crop growing or forestry, and that the efficiency of photosynthesis in plants is 0.5 percent, that is, that only 0.5 percent of the sunlight falling onto this area of land can be turned into carbohydrates. Then, if the population is 1.2 billion, each person can, on average, have over 5 tons of agricultural and forestry products annually. Of course, only part of these 5 tons of products can be directly used by man. By what method can people fully utilize solar energy? The method is the introduction of intermediate links. For example, the stalks and stems of plants, grass, leaves, and so on can be processed into all-purpose feed for domestic animals; cow dung can be used for growing mushrooms or feeding earthworms; and all-purpose feed can also be used for fish raised in ponds, which can, moreover, be raised at a number of different ecological levels. A multilevel high-efficiency ecological system can thus be formed. Other examples are that bones from meat can be processed into bone dust or even bone protein; leaves can be used for manufacturing leaf protein; and all these waste substances from agricultural products can also be used in the culture of unicellular organisms that yield proteins. These are examples of the introduction of intermediate levels in various aspects, and the resulting products can also be directly or indirectly used by people. Thus, our agriculture will no longer be the simultaneous development of the following 5 categories: farming, forestry, animal husbandry, sideline occupations, and fishery, but will be the simultaneous development of the following 10 categories: farming, forestry, animal husbandry, the raising of poultry and domestic animals, fishery, the culture of insects and worms (including bees and earthworms), the culture of mushrooms, the culture of microbes (marsh gas microbes, unicellular protein-yielding microbes, and so on), sideline occupations, and industry (including processing industries). There may even be more than

10 categories. This is the meaning of comprehensive, highly knowledge-intensive, and highly technology-intensive large-scale agriculture. We can consider building experimental bases which are characterized by the intensive use of knowledge and technology and which need a large number of technical personnel. We can first select some points, conduct experiments therein, and then sum up experience.

If things develop in this way, will another revolution in production arise? I think this is possible. Why? Let us first study solar energy. In our country, each square cm of land receives annually an average of 120 kilocalories of solar energy. That is, the solar energy received annually by the 9.6 million square km of land in our country is equivalent to 1,645 billion tons of standard coal. If photoelectric solar cells were placed on one-tenth of our country's land area, and if the energy conversion efficiency of these solar cells were 10 percent, then the electric energy we could obtain would be equivalent to 16.5 billion tons of standard coal. This figure is much higher than our current annual coal output of 600 million tons or our future doubled output of 1.2 billion tons. Another example concerns methane. In the light of the present area for growing crops, if the energy generated by photosynthesis in plants were converted into methane, the methane we could thus obtain for our use would be equivalent to the energy generated by over 2 billion tons of standard coal. A third example concerns wind power. If the wind power throughout our country's vast territory were utilized, several hundred million kilowatts of electric power could be generated. Therefore, if we consider utilizing the direct solar power and indirect solar power (including wind power and water power) available over our country's vast area of 9.6 million square km, then we will have a different concept of energy resources.

Second, we must also change our concepts of cities and rural areas. In other countries' histories, the building of cities has invariably involved the destruction of rural areas. However, in our country, cities and rural areas must be built simultaneously. Some 80 percent of our entire population would be in small rural market towns where they would carry out large-scale agricultural production and, in addition, there would be somewhat larger towns. The appearance of such a structural distribution of residents and the absence of significant differences between the cities and the rural areas in terms of each worker's labor productivity would be unprecedented in history.

The third point is that by the next century, the most effective and most technologically advanced residential sites would possibly be underground instead of above ground level, because the space above ground level would have been fully used. Living underground, people would feel warm in winter and cool in summer, and would not need so many air-conditioning and heating facilities. What does this prospect mean? It means that environmental problems would be completely solved. Throughout history, concerning the relationship between man and nature, man has always been at odds with nature, and up to now man has already suffered many losses. Perhaps in 21st-century China, man and nature would finally be more satisfactorily and more harmoniously integrated. Can we say this prospect is a minor matter?

IV. Broad Strategies

I think the question we must now consider is that by the centenary of the building of the PRC, we must make full use of all scientific revolutions, all technological revolutions, the several revolutions in production abroad, and the revolutions in production to come; we must learn from other countries' good experiences in connection with the organizational economic structures of their production systems. First, we must make up what we did not gain from the change in production system, or the revolution in production, that occurred at the turn of this century. Second, we must carry out the reform of our production system, which is an imminent change caused by a series of new technological revolutions. Third, we Chinese must also anticipate a possible coming series of changes in the organizational and economic structures of the production system, caused by changes in China's countryside. We must now make preparations for some of the things we will do by the centenary of the founding of the PRC. The elimination of three major categories of differences: differences between the cities and the countryside, those between mental labor and manual labor, and those between industry and agriculture, will be achieved in our socialist motherland by the 21st century. This is a very important matter. In the past, in studying scientific socialism, we always thought that probably the three major categories of differences would be eliminated under communism. Now, it appears that because of the development of scientific revolutions, technological revolutions, and revolutions in production, the elimination of those differences will not be a matter of the distant future. We are compelled to eliminate them. This important matter calls for a prompt carrying out of overall planning. Why do we mention revolutions in production? The reason is that we need to pay attention to the integration of the organizational and economic structures of the entire production system. That is, in considering what measures to adopt, we must not work out separate measures that correspond to separate technological revolutions. How can separate measures be added together? Therefore, we must consider broad strategies. This is a foreign term meaning overall or national strategies. The year before last, I said that the state's functions, or the things the state must do, fall into the following eight areas: First, the production of material wealth; second, the creation of spiritual wealth; third, the undertaking of social services, including communications and transportation, because communications and transportation do not merely serve the production of material wealth; fourth, the administrative system governing our entire country; this is the superstructure; fifth, the socialist legal system; sixth, international contacts; the totality of diplomatic and foreign trade contacts constitute an entity; seventh, national defense; and eighth, environmental protection; however, environmental protection alone is inadequate; we must also include the transformation of the environment. Now, it appears that these are not adequate, and we must have a ninth area, which concerns the questions of population, qualified personnel, education, the development of intellectual resources, and even the retirement of old comrades. We must consider all these questions, because ours is a socialist country, and the state must be responsible for everyone's entire life, from birth to death, including illnesses. The tenth area concerns the question of the ideological-political education front; this question is of particular importance now that our country is open to economic intercourse with other countries. These 10 areas must not be considered separately. They constitute an overall broad strategy.

I think in dealing with such a complicated matter, if we do not have new methods, but depend on the old methods of discussion, making judgment, and finally decisionmaking, then although success is possible, there is also a high probability of committing mistakes. Many lessons can be drawn from history since the founding of the PRC. The difficulty lies in the fact that we must neither be conservative nor make rash advances; we must take appropriate actions, seek truth from facts, and do things scientifically. What is meant by doing things scientifically? It means we must have quantitative analysis. Hitherto, quantitative analysis has been an aspiration which could not be fulfilled, because the questions concerning our entire society were too complicated; each area is of colossal magnitude and is very complicated. We now have 10 or more areas. To study or consider the entire country as an entity has been far too complicated a matter. In the past, we had neither theoretical methods nor computation tools. However, things are now different; we have both theoretical methods and computation tools. Therefore, by using scientific quantitative analysis to resolve the questions of broad strategies, we can scientifically anticipate how the whole nation will greet the new technological revolutions, the coming changes in the organizational and economic structures of the entire production system, and even the coming changes in the superstructure.

To accomplish this task, we must first conscientiously study the condition of the organizational structure of the production systems of the European and American countries, that is, the imperialist countries, which are advanced in production. We must then compare their condition with our country's present condition. We must clearly distinguish the decadent things of capitalism from those things which embody the objective laws of large-scale production systems. We must discard the former but take the latter for our own use. Otherwise, we would violate objective laws and fail.

Second, having observed the disparity, we must, in the light of the principles, guiding principles, and policies which have been clearly prescribed by the central authorities, put forth reform measures and formulate an outline of development for the early 21st century. Here, we must adopt the method of integrating the continuous revolution theory with the revolution by stages theory, consider carrying out the reform of our systems step-by-step and in successive stages, and so on.

Third, on this basis, we must use the systems engineering method. It means that we must apply systems engineering to the entire society and country, and we must adopt the method of overall social engineering, using computers to simulate our entire state system and to perform calculations. We must make simulated computations of the possible series of annual developments of our macroeconomic society. In this kind of computation, we will inevitably discover some problems; we will discover that some existing tentative schemes may not work or that some existing aspects of our state system are inappropriate and must be changed. All these will be quantitatively formulated and will not be just arbitrary ideas. After this kind of computation, we will be able to put forth optimum models. In this kind of computer simulation work, we will naturally need engineers in the fields of computer technology and natural sciences technology. However, I think those specialists who have been doing

economic work in our country for many years constitute a very important force for doing this kind of work. Their suggestions and viewpoints are valuable. How can we construct a computer simulation? What measures must we adopt? How can we conduct experimentation? We must have initial tentative ideas, which can only come from those specialists who have been doing economic work for many years, because they have practical experience. Of course, we must also listen to opinions from all quarters.

Fourth, we must formulate annual plans according to this kind of long-term planning. The annual plans can be readjusted according to the results of implementation. Such readjustments will in turn inevitably affect long-term planning, that is, the results of analysis by computer simulation must still be continually revised through the test of practice.

After going through this process, we will be able to use scientific methods to formulate our state plans. By the centenary of the founding of the PRC, that is, a mere 65 years from now, our country will experience earthshaking changes. I think some old concepts will probably become inapplicable. Old concepts were gradually formed in a time of relative stability and relatively slow social development. I daresay that what we now call currency, commodity prices, fiscal revenue and expenditure, and so on, may no longer be useful. The reason is that ours is a rapidly developing, dynamic society; what the old concepts deem to be good may no longer be good, and what they deem to be bad may no longer be bad. What is good or bad? We must not proceed from concepts, but must consider and test the things concerned according to practical results. That is to say, when we appraise plans and tentative ideas, we must not use old concepts, but should set forth and use new indicators. The new indicators for our country as a socialist country can only include the people's happiness, the people's livelihood, the enhancement of the people's intellectual and cultural standards, the growth of our national resources, and so on.

V. A Few Concrete Proposals

First, we must organize scientific and technological personnel to study the real nature of the organizational structure of the production systems of foreign or imperialist countries. We must find out what aspects are useful things which embody objective laws of modern large-scale production and which we must take for our own use, and what aspects are the decadent things of capitalism which we must not take. We must devote efforts to studying this matter.

Second, we must organize scientific and technological personnel to predict possible future scientific revolutions, technological revolutions, and revolutions in production. We must take the initiative to learn about them, rather than doing so only after hearing about them.

Third, we must study overall strategies, for example, the interaction between scientific revolutions, technological revolutions, and revolutions in production and social revolutions. Sometime in the past, I mentioned the science of socialist countries. This is a discipline that studies socialist countries. In natural sciences, the term "dynamics" is frequently used. Likewise, we must study "dynamics" instead of "statics." We must study the whole instead of the part, the development of things instead of the static state of things.

Fourth, we must have an organ responsible for overall state planning. This tentative idea of mine arises from my own work over many years in developing missiles. Missiles are very complicated. The whole thing cannot be mastered by just a chief designer, or a chief designer with the help of a few assistant chief designers. There is a group of people, collectively called the overall designing department, who work for, advise, or render services to the chief designer and the assistant chief designers. This overall designing department thoroughly familiarizes itself with every aspect of the entire complicated system, and then combines the information, analyzes it, makes computations, finds out the results and problems, and submits reports to the chief designer and his assistants. Only then can the chief designer and his assistants make judgments according to the results of these specific computations. Our chief designer and his assistants would be powerless without this overall designing department. Therefore, I think that concerning the present question of our entire country, there is an even greater need for such an "overall designing department" and for specialists from various fields. Without such an overall department, the set of modern scientific methods we have just discussed will come to nothing, because this organ must perform very complicated calculations, which may have to be done by computers capable of doing tens of millions or a hundred million calculations. We must study how old methods can be made applicable to our questions, and we must also create and study new methods.

Fifth, we must develop the science of systems. The existing systems engineering methods can be used. However, they are inadequate for resolving such a complicated question as that of our country. With this inadequacy in mind, we must achieve further development in scientific theories and in theories of the science of systems. Only thus can we keep pace with our overall needs.

We have the right methods, large computers, and many specialists. Organizing our entire personnel, machinery, methods, and theories to meet the challenges facing us, we certainly can, in doing what was left undone in the past, achieve success in the period prior to the centenary of the founding of the PRC.

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NATIONAL DEVELOPMENTS

IMPLEMENT REFORM IN SCIENTIFIC RESEARCH UNITS

HK050723 Beijing GUANGMING RIBAO in Chinese 24 May 84 p 1

[Commentator's article: "It Is Necessary to Actively Popularize the Experience of Zhuzhou Electronics Research Institute in Carrying Out Reform"]

[Text] Universal attention has been aroused by the experience of Zhuzhou electronics research institute in implementing the contract system with compensation externally, and the contract system for tasks internally, changing itself into an independent economic unit, from relying on state allotment of expenditures for the undertaking. This is because the institute has grasped the key problem in the structural reform of science and technology, representing the orientation of reform in all units of scientific research engaged in technological development, popularization, and application. It is helpful to linking scientific research work with economic construction, promoting the application of the results of scientific research to production and transforming them into practical economic and social effects; it is helpful to expanding the decisionmaking powers of the research institutes, enabling them to do a better job in invigorating science and technological work; it is helpful to breaking up the ownership of research institutes by departments, bringing into play the power of the research institutes, so as enable them to better serve the whole society; and it is helpful to promoting the internal reform of units undergoing scientific research, overcoming the malpractice of "everybody eating from the same big pot," bringing into full play the initiative of science and technology personnel. Through this reform, all long-existing malpractices in these science and technology units will be easily solved.

At present, a number of scientific research units engaged in technological development, popularization, and application are experimenting with the contract system with compensation in all parts of the country, many units having successively proposed to learn from the Zhuzhou electronics research institute their experience in reform, vying to become experimental units in reform. Facing this situation of pressure for reform, relevant administrative departments and leading comrades should continue to eliminate "leftist" influences, resolutely implement the Central Committee's spirit of reform, and take part in, promote, and protect reform. It is entirely wrong not to go in for reform while refusing to let others do so, going so far as to become a stumbling block in reform by attacking reformists. At the same time, it is also wrong to waver and hesitate before reform.

Changing to the contract system with compensation from allotment of expenditures for an undertaking by the state will inevitably involve the transferring of power to lower levels by responsible departments. Because of their structure, some responsible departments have, for a long time, relied on their administrative authorities in conducting the work of research institutes, relying on the undertaking funds allotted by the state in the administration of scientific and technological work, which has greatly restrained the initiative of the research institutes. The change to the contract system with compensation from allotment of undertaking expenditures by the state will necessarily incur the loss of some power by the responsible departments. However, it does not mean in any way that they will sit idle and accomplish nothing. On the contrary, their responsibilities will be heavier. Under the new situation, it is not that those scientific research units wanting reform wish to do away with the leadership of departments at higher levels, but that they desire all the more guidance from the responsible departments, wishing departments concerned to open the road for their reform, creating for them necessary conditions, promoting their reform in healthy and smooth development. This requires responsible departments to suit themselves to this new situation. While doing a good job in reform in their own departments, they should give guidance, support, and aid to the research institutes in doing a good job in their reform.

The structural reform in science and technology involves many complicated problems in economic policies and the personnel system, requiring synchronous progress with the reform of the whole economic structure. The change to the contract system with compensation from allotment of undertaking expenditures by the state in research institutes should win the universal support of various aspects, including personnel, taxation, industry and commerce, goods and materials, and so on. In this aspect, many localities and departments are making efforts, formulating measures which are helpful to reform. However, we should also see that because people do not have a deep enough understanding of the significance of the structural reform in science and technology, because of the limitations of some existing policies to be adjusted and revised, because of the tendency to be concerned only with partial interests, and so on, in some departments there is a lack of practical action in supporting reform. The new situation requires various relevant departments to start from the viewpoint of being helpful to the whole situation in reform, to adopt various active measures in giving the green light to structural reform in science and technology, and to support and encourage scientific research units in carrying out reform boldly.

As the change to the contract system with compensation from the allotment of undertaking expenditures by the state in scientific research units engaged in technological development, popularization, and application is a major reform, it requires scientific research units to actively create conditions for it with the courage for reform. The worry of some people that reform will stop them from "eating from the same big pot" of the state, incurring the loss of their sense of security," and the mentality of being dissatisfied with actual conditions but not daring to change them are expressions of inertia in those people. The lack of courage in reform and not daring to exert pressure on oneself is an expression of a lack of motive force, resolution, and ability. At present, for the majority of scientific research units, a most important point is to do a good job in the consolidation of the research institutes, through which to create conditions for reform under the guidance of the spirit of reform.

NATIONAL DEVELOPMENTS

NEI RONGZHEN HAILS SCIENTIFIC EQUIPMENT FORUM

HK301047 Beijing RENMIN RIBAO in Chinese 28 May 84 p 3

[Report: "Comrade Nie Rongzhen, Vice Chairman of Central Military Commission, Sends Message of Congratulation on Forum Held by the China Scientific Equipment Corporation"]

[Text] On 27 May, when the Second Session of the Sixth NPC and the Second Session of the Sixth National CPPCC Committee were being held in Beijing, the China Scientific Equipment Corporation under the State Science and Technology Commission invited the members of the board of advisers of the corporation to a forum to discuss the problems concerning the modernization of scientific and technological equipment and to listen to their suggestions on the work of the corporation. Of the advisers present at the forum, some were deputies to the NPC and 27 were CPPCC committee members.

The forum was held on the 22d anniversary of the founding of the China Scientific Equipment Corporation. It was founded with the approval of the leading comrade of the State Council. Vice Chairman Nie Rongzhen of the Central Military Commission wrote the forum a letter encouraging them to vigorously and closely cooperate with one another, to serve scientific research better, to make a further success of the work backing scientific research, to be unknown heroes on the scientific and technological fronts, and to make new contributions to the motherland's four modernizations. Commander-in-chief Nie's letter showed his concern for, and acted as an encouragement to the logistic workers in scientific research and all the people working on the scientific research front. At the forum, old and middle-aged scientists such as Wang Dezhaoh and Xiu Ruijuan spoke one after another. They said: Comrade Nie Rongzhen, who proposed the establishment of the China Scientific Equipment Corporation in 1962, strives to implement the principle of "serving scientific research and scientific and technological work and is an excellent logistic worker on the scientific research front. Those attending the forum hoped that people engaged in the production of scientific equipment would resolutely carry out reforms in order to adapt themselves to the new situation of the development of science.

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NATIONAL DEVELOPMENTS

HEFEI TECHNOLOGICAL REVOLUTION SYMPOSIUM ENDS

HK181537 Beijing GUANGMING RIBAO in Chinese 10 May 84 p 1

[Report by reporters Hu Yang [5170 5017], Xie Jun [6200 6511], and Xue Changci [5641 2490 6101]: "Symposium on New Technological Revolution and System Restructuring Successfully Ends"]

[Text] Hefei, 9 May--The symposium on the new technological revolution and system restructuring sponsored by Deng Xuchu, Bu Xinsheng, Wen Yuankai and other well-known reformers ended here triumphantly today.

In the past 5 days, some 100 reformers have freely talked about their experiences in reform at the symposium, or at group discussions. They said: Varied and colorful experiences in reform fully show that reform has brought vitality. Reform is where the hope lies in modernization. Reform is the way to make the country prosperous and the people rich. At present, our economic, scientific and technological, and educational management systems are not geared to the development of productive forces and to the challenges of the new technical revolution in the world. Reform is inevitable. Without reform, there is no way out. At the symposium, experts of the Chinese Academy of Social Sciences, the Beijing University, the Beijing Normal College, and the Scientific and Technical College of China dwelled on the background behind the new technical revolution of the contemporary world and its far-reaching influence. This has enabled the participants to have a better idea of new world trends in scientific and technological, economic, and social development, and to further arouse their sense of responsibility of the era to meet challenges and push reform forward.

Vivid and rich experience in reform has opened up a vast area of theoretical studies. With extremely great interest and in a down-to-earth spirit, theory workers and reformers at the symposium made initial explorations of the problems of theory posed in practice. Higher education workers had heated discussions on such problems as the aims of higher education, educational development patterns, import of technology, and so forth in the reform of higher education. Economic workers analyzed and explored such problems as market prediction, the clash of many economic targets, harmony between macroeconomics and microeconomics, how to establish a socialist economic pattern with Chinese features, and so forth. At the meeting, many reformers and theory workers were enabled to deepen their understanding and form friendships. Everyone expressed the determination to join forces, show mutual help and seek progress together.

The leading comrades of the Anhui Provincial CPC Committee and the provincial government showed great concern over this symposium. Huang Huang, secretary of the provincial CPC Committee, and Yuan Zhen, Su Hua, Lu Rongjing, Yang Jike, and others attended the closing ceremony. On behalf of the provincial CPC Committee and the provincial government, Yuan Zhen extended warm greetings on the successful conclusion of the rally. He also gave a speech entitled "Mankind Advancing in Reform." He stressed that to make reforms, a very important problem is that party committees and the leadership at all levels must fervently support reformers and be good at discovering tender buds and supporting new things. He said that a good leader must have the courage to actively support reformers, pave the way for them and remove all obstacles in their way, when faced with comments, dissenting views and even "accusations." He must dare to show strong support for reform. He must also take the lead in effecting reforms and be at the van of reform holding a clearcut banner.

Lu Zhun, deputy editor-in-chief of GUANGMING RIBAO, and Wen Yuankai, one of the sponsors of the symposium, successively made speeches at the closing ceremonies. Liu Guangcai, member of the standing committee of the Anhui Provincial CPC Committee and chairman of the Science and Technology Committee, gave a closing speech.

This meeting received the attention of national public opinion. More than 110 reporters of 50-plus news units at the central level and from various parts of the country attended the closing ceremony.

CSO: 4008/336

NATIONAL DEVELOPMENTS

COMMENTATOR'S ARTICLE ON HEFEI SYMPOSIUM

HK181507 Beijing GUANGMING RIBAO in Chinese 10 May 84 p 1

[Commentator's Article: "Reformers' Hopes"]

[Text] The symposium on the new technological revolution and system restructuring has triumphantly come to an end. More than 700 reformers on the scientific and technical, educational and economic fronts and social science workers got together exchanging experiences and studying problems of theory on the new technological revolution and the restructuring of systems. All of the participants aired their views, spoke freely, made explorations boldly and held mutual discussions, turning the meeting into a rip-roaring, lively, and dynamic affair and enabling it to show expected results and relatively great success.

At present, the situation is very favorable, as far as economic reforms in our country are concerned. Marked results have been achieved in the effort to make economic reforms in the countryside--an effort which is developing in breadth and depth. Economic reforms in cities, with urban features in mind and with the benefit of useful experiences in rural economic reforms, have shown very good beginnings. Reforms involving the scientific and technical, and educational systems are also being carried out. That large numbers of reformers in all lines and trades, and social science workers have got together in Hefei this time is a gala event on our scientific and technological, educational, and economic fronts in recent years. It has reflected a very favorable situation in making reforms. It points to an important reality existing in our country: Reform is what the people desire and is an irresistible trend.

Most of the reformers participating in this meeting are explorers in the reform of the scientific and technological, educational and economic systems. In practice, they deeply appreciate that to realize the great goal put forth at the 12th National Party Congress calling for quadrupling total industrial and agricultural output by the end of this century and to build socialism with Chinese features, we cannot follow the beaten path or fall into a groove and use a fixed pattern for economic and cultural construction. This does not work. The only way out is to emancipate the mind and make reforms boldly. Especially at a time when we are facing the serious challenge of a new technological revolution in the world, we cannot advance at a quicker pace without reforming the relations of production incompatible with the development of

productivity and the superstructure incompatible with the economic base, and without reforming all inappropriate ways of management, ways of operation and ways of thinking. The reformers have expressed the hope that the whole society will have a sense of urgency and a sense of responsibility in carrying out reforms and will no longer show hesitation or lack of confidence.

Since reform is a revolution, it cannot be all plain sailing. The CPC Central Committee has once and again advocated reform and stressed the need to create a new situation in a creative spirit. The masses of people have also shown a strong desire for reform. But as "leftist" thinking in certain areas still acts like a chain with its binding effect on some people's minds, and some units and departments still remain shut out of the wind like the "Yumen Pass," the buds of reform can hardly strike root and the flowers of reform can hardly come out. Therefore, the reformers attending the meeting have expressed the hope that the party committees and the relevant departments at all levels will thoroughly get rid of the influence of "leftist" thinking; take the down-to-earth materialist ideological line defined at the 3rd Plenary Session of the 11th CPC Central Committee as a guide in viewing the new things appearing in the current reform; correctly treat reformers and give them "flexibility"; encourage them to emancipate the mind, make bold explorations and create the new with courage; show no hesitation in letting them carry out reforms; support them in reform; allow them to fail in reform; and help them sum up experiences and do work in a down-to-earth manner. The aim is to carve out a new path for the proper operation of socialist enterprises and scientific and technical, and educational undertakings.

Practice is the fountain and base of theory. Now practice in reforms being carried out in various lines and trades has got ahead of theory and brought vitality to theory. Meanwhile, many reformers in the process of exploration have felt a compelling need for the tool of theory as a proper guide to their practice. That the theory workers attending the meeting received a warm welcome by the reformers is a reflection of this situation. Reformers fervently expect the theory workers to join and help them in summing up experiences and finding theoretical explanations for the new things appearing in reform and help them in upholding what is correct and rectifying what is wrong, so that practice in reform can become more conscious action and be marked with still greater achievements. We believe that the masses of theory workers will surely not betray the hopes of the reformers. We wish that the theory workers and the practical workers will team up and bravely forge ahead along the revolutionary path under the guidance of the CPC Central Committee.

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NATIONAL DEVELOPMENTS

MAKE SCIENCE SERVE ECONOMIC CONSTRUCTION

OW230621 Beijing XINHUA Domestic Service in Chinese 1442 GMT 22 Dec 83

[XINHUA commentator's article: "Science and Technology Must Be Oriented Toward Serving Economic Construction"]

[Text] Beijing, 22 December (XINHUA)--Premier Zhao Ziyang pointed out at the National Science and Technology Awards Conference last year: Economic construction must rely on science and technology. Scientific and technical work must be oriented toward serving economic construction. This is an important strategic policy decision adopted collectively by the leading comrades of the central authorities after thorough discussion.

Many people still fail to thoroughly understand this strategic policy decision, which has an important bearing on the future of our modernization. Therefore, it is imperative to study once again and understand this policy decision and adopt more effective measures to implement it.

As you know, in order to achieve the strategic objective of quadrupling the gross annual value of industrial and agricultural production by the end of this century, as put forward by the 12th CPC National Congress, it is necessary, aside from following a correct policy and bringing into full play the creativity of the masses of people, to rely on scientific and technical progress. Without advances in science and technology, it is impossible to carry out modernization. Those comrades in scientific and technical circles who earnestly wish to attain the grand strategic objective put forth by the 12th CPC National Congress must take immediate action to enable scientific and technical work to be oriented toward serving economic construction.

In order to make science and technology truly oriented toward serving economic construction, it is of course necessary to adopt appropriate measures to reform the existing management system and rules and regulations. Presently, there are still quite a few problems in China's scientific and technical system. A considerable portion of the scientific and technical facilities and resources of scientific academies, institutes of higher learning, production units, local governments and military industrial departments are redundant and decentralized, causing much waste in manpower and materials and offsetting many advantages. For example, tens of or nearly hundreds of units often rush to study the same new fields of science and technology on a rather low level, while some technical questions involving a vast field and a large quantity in

production, especially subjects concerning economic efficiency, are neglected. Another serious problem is the deviation of scientific and technical work from economic construction as seen from the fact that results of scientific research have been used year after year only for displaying products and sending out samples and gifts and have not been speedily applied in production. Due to the gap and lack of coordination between scientific research and production, many scientists who earnestly want to contribute to modernization complain that there is no way for them to serve the country. Production departments also show no interest in new technology because they have not benefited from its advances.

It is imperative to resolutely reform systems that have been hampering productive forces. We may start out with first adopting easy measures and then proceed with difficult ones by carrying out reforms in which we are likely to succeed. Judging from the present situation, reform of the scientific and technical system should be carried out mainly in the following two fields: First, it is necessary to overcome the gap between scientific research and production. Although a tremendous amount of work has been done in recent years to overcome this shortcoming, many scientific research projects have been impractical as related to production while the research cycle has also been too long. A system that can link scientific research with production should be adopted. Second, it is necessary to bring into better play the role of talented personnel. The problem here is that although there is an acute shortage of talented personnel in some scientific and technical departments, a large number of such personnel have been laid idle by some units. The system should be reformed so that scientific and technical personnel can bring into full play their talents.

As early as more than a century ago, Engels said: The creation and development of science are decided by production from the very outset. There are many examples of this. A review of the history of the development of science and technology in various countries in the world shows that scientific research that is carried out purely for scientific purposes lacks vitality. The general rule is that a problem arises in production, and this requires scientists to study it. As the problem is solved by the scientists, it promotes the development of production. Then, a new problem arises in production. This repeated cycle promotes production and brings about advance in science and technology.

Some comrades worry that development of applied science affects research in basic theory. Their worry is unnecessary. The party central committee has formulated a strategic policy and mapped out specific arrangements for protecting, in clear-cut terms, the sustained growth of research in basic theory. Moreover, basic theory and applied science supplement, rather than contradict, each other. Advances in applied science may turn up a new research subject in basic theory. They can also bring prosperity to the country, which in turn can spend more manpower and financial and material resources on studying basic theory.

Economic construction must rely on science and technology. Scientific and technical work must be oriented toward serving economic construction. This is the principle guiding scientific and technical work, as well as the basic policy in our country's modernization. It is hoped that the comrades in the scientific

and technical circles and in the economic circles and the responsible comrades of the departments concerned will thoroughly understand the guidelines of the policy set forth by the central authorities. When they really understand this policy, they should earnestly study how to adopt measures in terms of policy and systems and implement, with concrete actions, this important strategic policy of the party Central Committee. Only if this strategic policy decision is really implemented, can China's modernization become a magnificent reality.

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APPLIED SCIENCES

JOURNAL ENCOURAGES GEOLOGICAL WORK IN XINJIANG

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 2, 1984 pp 13-15

[Article by Chen Zhefu [7115 0772 1133]: "Understanding and Knowing Geological Scientific Research Work in Xinjiang"]

[Text] In carrying out various tasks aimed at opening up new vistas in geological work in Xinjiang, we must firmly grasp the important link of geological scientific research work. Under the prerequisite of achieving greater results in the geological prospecting for ores and increasing economic and social benefits, this calls for doing a good job in line with Xinjiang's actual conditions and according to the objective laws of geological scientific research work. How can scientific research be better coordinated with geological prospecting for minerals?

First, the guiding principle to follow is to further understand the importance of identifying geological scientific research with economic construction and geological prospecting for ores before setting out to determine the tasks and subjects of scientific research. In selecting topics for scientific research and outlining the contents of comprehensive and multipurpose research, we should concentrate our efforts on solving perplexing and difficult problems arising from the geological prospecting for minerals.

Second, we should proceed from actual conditions. Xinjiang is a vast and physically inaccessible region with complicated geological strata and abundant mineral deposits. Lacking a solid base for providing adequate research facilities, the region is ill-equipped for carrying out heavy tasks. At the same time, we should also take note of the region's immense potentialities for economic development. Much can be done in geological work. These important factors must be weighed before planning to go ahead with geological prospecting for ores.

Third, in making arrangements for geological prospecting for ores in the region at present, we should follow the principles of consolidating bases, ensuring priorities, upgrading technology and expanding areas. Scientific research workers should mainly focus on the study of basically geological ores, mineralization prospects, new technologies and geological technology from an economic aspect. Major items consist of the following:

1. A study of basic geology. This requires comprehensive charting and mapping of the region's geological strata so that top priority can be given to the study of its basic geological topics.
2. A study of ore geology. This involves making charts and maps pinpointing the region's mineral deposits, including key mineralization prospects (belts), research on the geological features of mineralized areas, ore prospecting directions as well as a study of zonal division and typical mineral beds.
3. A study of hydrogeology. This calls for the preparation on a comprehensive scale of sets of the region's hydrogeological charts and maps, placing particular emphasis on an extensive study of every aspect of hydrogeology as well as conducting research on the hydraulic, engineering and environmental geology of the region's certain key construction projects.
4. A study of the extensive application of new technologies. Main emphasis should be placed on ore prospecting engineering, experiments and tests, geophysical and geochemical prospecting methods, preparation of maps and charts, etc.
5. Conduct extensive scientific research on geology. This involves a study of the multipurpose utilization of certain dressed and refined ores, the economic viability of minerals that have been evaluated as well as other subjects requiring study such as geological technology, economic science and management science.

Fourth, scientific research work, along with regional investigation, general survey and the prospecting stages of work, should be undertaken with clearly defined objectives in mind. This should also be carried out according to different stages and different requirements to as to provide guidance to geological prospecting of ores. Scientific research of a strategic nature mainly refers to a study of the region's basic geology, basic minerals and basic hydrogeology. Scientific research on a war footing mainly includes a study of regional and geologically important basic geology, key areas offering mineralization prospects, mineralization laws and ore prospecting directions. Scientific research of a tactical nature involves a study of related programs carried out synchronically in conjunction with geological work.

As Xinjiang abounds in strata of complicated structure, fine mineralization conditions and a large variety of minerals, it offers advantages to geologists prospecting for ores and scientific research workers. However, the region is so vast and the extent of research conducted still so limited, that apart from the rather complicated factors found in the structure of the earth and minerals and a lack of accessibility in some areas, as well as a large number of problems that have cropped up and requiring close study, it has become a relatively arduous task to conduct scientific research there. It should also be pointed out that in selecting subjects for scientific research, importance should be attached to paying

more attention to the region's geological structure and minerals. On the other hand, a systematic study of the prominent features of the region's certain geological topics and minerals should be undertaken in a planned way in conjunction with the current geological tasks. For example, Xinjiang's Tianshan Mountain is one of the country's typical regions with developments of polycyclic tectonic movement, while Tarim Kuruktag is one of the regions with a fairly well developed Sinian system. Regional metamorphic facies, metamorphic facies system and metamorphism are relatively complete in Tianshan and regions north of the mountain. Altai is China's famous regmatite mineralization belt (rare and white mica). Xinjiang is also rich in coal, with an estimated one-third of the country's total deposits. As to Taim and Junggar, they offer fine petroleum prospecting prospects. The chromium mine in west Junggar is one of the country's scarce regions close to the Variscan gold deposits zone offering fine ore prospecting prospects. Karatunggu and other areas north of Junggar's border are characterized by the mineralization of the nickel copper sulphide related to basic rocks scarce in other mining areas. An intensive study of these subjects highlighting prominent geological minerals will be of vital importance to propelling Xinjiang's geological scientific research work, achieving greater results in geological ore prospecting and raising the scientific levels of geological investigation and study.

In conducting geological scientific research work in Xinjiang, we should pay attention to the method of "spreading over a whole area from one point and seeking the points from the whole area." For example, conducting a comprehensive study of the Variscan gold mine zone based on prospecting data obtained from a general survey of the region's individual mineral veins (ores) is helpful to gaining a general understanding of the gold mine's regional geological characteristics. However, due to a relatively low level of overall research, particularly a lack of conscientious study efforts in mining areas requiring a high degree of labor, intensive problems relating to certain crucial basic geology (such as magnetic activity and fracture structure etc.) and linked to the mineralization of gold deposits in that region have as yet not been satisfactorily solved. As to the region's mineralization law, prospects for mineral prospecting and sections rich in ore deposits, we have not been able to provide sufficient supporting grounds. This has affected plans for further conducting a general survey or ore prospecting work.

Second, more work has been confined to individual points and less to study over the whole area. Little attention is also paid to the study of problems related to mineralization and regional basic geology, to research on mineralization laws governing ore belts and ore prospecting prospects. This will inevitably affect the results of geological prospecting for minerals in the belts. For example, since a relatively intensive study was undertaken on certain mining zones in the chromium mine of west Junggar and in the iron mine of east Xinjiang especially comprehensive research on the control of mineralization factors and ore-bearing locations, with better results achieved in ore prospecting, mineralization prospects have increasingly brightened. This is also of positive significance in promoting the work of summarizing the mineralization characteristics at

at these mining regions. However, research work undertaken in these two regions, particularly that of concentrating efforts on achieving greater results in geological ore prospecting, has not been conducted fully and penetratingly. Consequently, insufficient grasp of mineralization laws relating to chromium and iron ore belts and lack of further study of mineral prospecting prospects in these regions and the direction of major assaults have thus affected the achievement of new breakthroughs in ore prospecting in these belts.

How can scientific research on geology be conducted in such a way as to combine individual points with the whole area? Judging from Xinjiang's actual conditions, we should combine our study of the whole region with that in other regions and key sectors (mining regions). Bureaus, teams and detachments should divide scientific research work among them precisely according to their specific tasks and conditions and in appropriate proportions. Detachments should undertake such research that fully corresponds to their particular fields of geological work, placing emphasis on carrying out basic and comprehensive study in their own areas by combining the application of new techniques with new methods for experimental and propagation purposes. Some detachments should also conduct special research topics on typical ore beds and specially designated areas (sections). Since detachments are assigned to undertake highly practical research, they strive to solve in a timely way problems involving scientific and technological aspects during geological ore prospecting, providing guidance to field work and construction arrangements, improving the quality of investigation and study, as well as achieving greater results in ore prospecting. The study of items involving a general survey, evaluation and prospecting in particular should be directed toward drafting specific plans for finding new ore deposits and broadening mining prospects.

The research work of a composite team (geological team) should stress the importance of exploring the region's mineralization characteristics and comprehensively analyzing the direction of ore prospecting, while carrying out the ore prospecting task in its own area, so as to solve scientific and technological problems encountered during ore prospecting and to achieve greater results in geological prospecting for minerals. On the basis of its research findings, it should present fully established geological data in the service of its ore prospecting problems and in other selected areas. Specialized teams (regional geological survey, hydrogeology, geophysical and geochemical prospecting and charting, etc.) and experimental departments should concentrate their efforts on summarizing basic work and study, mapping and providing texts throughout their own areas according to their assigned tasks and special characteristics. At the same time, they should also study special topics of a regional nature and conduct experiments on new techniques and methods for propagation, apart from continuously improving research, raising scientific and technological levels, and solving scientific and technological problems encountered in their specialized tasks so as to provide a scientific basis for geological work in the whole region (or of a regional nature).

Research institutes under the bureaus should primarily study mineralization characteristics throughout the entire region (or of a regional nature), laws of distribution and estimation of ore reserves. In conjunction with the zoning of mineralization prospects, they should concentrate their efforts on the drafting of mineralization laws, maps about mineralization prospects and certain related charts. With these in mind, they should seriously study the geological structure of ores in mineralization zones offering promising prospects and basic geology of a crucial nature. After earnestly solving basic geological problems closely related to major ore deposits, they should provide ore prospecting signs while narrowing target areas. In doing so, they will unceasingly upgrade research and raise scientific and technological levels, thus providing a scientific basis for the bureaus to draw up plans and arrange geological prospecting for ores.

Making rational arrangements for providing technological forces with materials to conduct scientific research on basic geology, mineral geology and technological methods: Proceeding from Xinjiang's actual conditions related to scientific research on geology and on the basis of different scientific research tasks, the following ways of organizing scientific research should be adopted:

1. If research on a particular subject is conducted in conjunction with geological work, it should be undertaken by the detachment responsible for that item. In this way, investigation and study are combined, obviating the need for an additional research unit.
2. Any single scientific research item is tackled by the scientific research institute of the bureau or the combined research unit (office) of a field team. Or it may be assigned to any type of cooperative groups.
3. Organize scientific research institutes under bureaus or related field teams or institutes and teams for group participation in nationally circulated assigned topics transmitted from the ministry to the lower levels.
4. As to topics for scientific research that have been uniformly organized by the bureau, scientific research institutes of bureaus as well as related field teams (offices) are to be organized according to the principle of grouping specialized trades undertaken along identical lines. Under centralized leadership, overall planning and unified requirements, they can be accomplished by division of work and commitments or through the integration of technological forces under the direction of the bureau.
5. The technological backbone of field teams may participate for a certain period in units doing research on specialized fields undertaken along similar lines as well as research work conducted by institutions of higher learning. Other attempts involve observation and trial implementation of research systems in a planned and systematic way.

(Geological Minerals, Bureau
Xinjiang Uigur Autonomous Region)

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